Climate Change, Natural Hazards and the Auckland Unitary Plan: Too little too late?

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ABSTRACT

Natural hazards remain a substantial risk for the people of Auckland, its property and its infrastructure. With over 3100 km of coastline and extensive urbanization, Auckland remains vulnerable to hazardous coastal erosion and accretion processes. This new city, which from the first of November 2010 became a new Unitary Authority through the amalgamation of 7 Territorial Authorities and 1 Regional Council, is required by law to instigate a new Auckland Unitary Plan. The final form of this Unitary Plan, particularly the section on natural hazards, will have long-term consequences for Auckland and its ability to mitigate the effects climate change will have on these coastal erosion processes.

This paper will outline the background to the proposed Auckland Unitary Plan, analyze the public submissions in the section devoted to natural hazards, and comment on its intention (a first for a Unitary Plan in New Zealand) to include mapping of predicted coastal inundation and sea level rise across the Auckland isthmus. The writer will examine the effect the "new" policy approach to mitigating coastal hazards will have on the existing and future make up of urban settlements in low lying coastal areas. A case study will be presented.

KEYWORDS

Climate change, coastal inundation, sea-level rise, proposed Auckland Unitary Plan

INTRODUCTION

The recent Christchurch earthquake, with subsequent destruction of property and loss of life, has thrown into sharp focus the risk to New Zealand communities from natural hazards. New Zealand is a small island country with a long coastline. With 65% of its inhabitants living within five kilometres of the sea, the country's wellbeing remains vulnerable to a range of hazard events, including flooding, land instability and coastal inundation caused by tidal surges exacerbated by rising sea levels. Other low likelihood but high consequence events include tsunami, earthquake and volcanic eruption.

Auckland Council, the new "super city" and Unitary Authority formed by Act of the New Zealand Parliament in 2010 from an amalgamation of 7 territorial Authorities and 1 Regional Council has, as required by law, instigated the preparation of a new city wide plan called the proposed Auckland Unitary Plan (PAUP). The PAUP is in fact a series of plans that detail how the city will deal with managing the "use, development and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety." [1] It is hence a combined regional policy statement, regional coastal plan, regional plan and district plan. It is the primary document through which the unitary authority, the Auckland Council, meets its obligations under the overriding legislation, the [New Zealand] Resource Management Act

1991 to protect community health and wellbeing from any negative environmental effects arising from poor air quality, excessive noise or vibration, poor quality landfills or earthworks, and the like, and including the main focus of this paper, natural hazards.

THE PAUP AND NATURAL HAZARDS

The PAUP defines its task in the natural hazards section as mitigating in its planning processes "the adverse effects of natural hazards on human life, property, infrastructure and the environment, while minimizing the adverse effects of measures implemented to reduce the risks of natural hazards". [2] To achieve this goal, the planners tasked with the preparation of this section initially considered identifying and mapping all known hazards within the new city of Auckland as an integral part of the PAUP, an extremely challenging task, eventually considered too difficult to achieve given the inconsistencies and gaps in the historical information provided by the individual legacy councils in operation prior to amalgamation. It was hence rejected in favour of natural hazards information, such as is known, being made available on separate Council databases. Auckland Council view this approach, with some justification, as more efficient and pragmatic, ensuring the latest information –capable itself being updated -is provided to the public at all times, without the plan change process that would be required should such information be legislated as a part of the PAUP.

At risk land, or land subject to natural hazards, includes very steep land, unstable land, land very close to the sea or waterways or subject to erosion, coastal inundation and SLR. That is, all land defined by the PAUP as:

a. within a horizontal distance of 20m landward from the top of any cliff with a slope greater than 1:3 (18 degrees)
b. land on any slope with an angle greater than or equal to 1:2 (26 deg.).
c. land at an elevation less than 3m above Mean High Water Spring (MHWS) if the activity is within 20m of MHWS
d. any natural hazard area identified with the Council's natural hazard register or database or GIS viewer. [3]

The use of overlay maps in the identification of natural hazards.

The digital mapping overlays within the PAUP that define coastal land subject to inundation and SLR are the one exception to this "no mapping" policy. These are an innovation potentially of considerable use for those using the PAUP digitally. Experts suggested such mapping, unlike the inclusion of other natural hazards, was a feasible proposition.

To achieve this, a claimed first for any council in New Zealand, the Auckland Council assigned the National Institute of Water and Atmospheric Research (NIWA) to instigate a series of overlay maps based on cadastral level information, which when overlaid over any zone map, provide information about the projected extent of coastal inundation within a zoned area. The two data sets that determine the extent of land so affected are 0.5metres above either (1) a 1 in 100 year event (1%AEP) + 1m SLR –for brownfield areas (i.e. areas already built on) and (2) a 1in 100 year event (1%AEP) + 2m SLR –this set applicable for greenfield areas only. A 1%AEP is equivalent to a 1 in 100 year storm event that on average has a probability of occurring once in 100 years. It may happen several times within any 100year period. It is also an estimate based on historical records plus predictions for the future. Within this 100 years there may be events that exceed the 1% event (e.g. a 1 in 1000year event).

The intent of these overlays was to minimize the risk from coastal inundation and SLR in existing areas and avoid it completely for the foreseeable future in new greenfield areas. The photo on the left in Figure 1 illustrates the extent of coastal inundation for data set (1) in a portion of Kawakawa Bay.

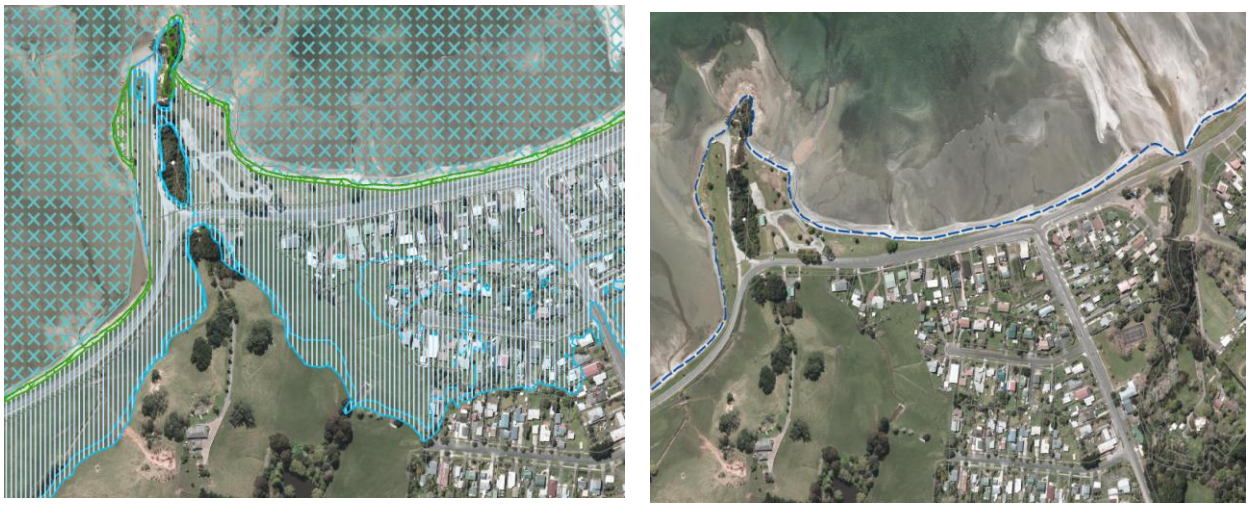

Figure 1. Digital overlay (left) to part Kawakawa Bay map (right) showing extent of coastal inundation predicted for a 1% AEP + 1 metre SLR event. (Source PAUP).

Each application for development within land defined by the rules and susceptible to natural hazards such as erosion, instability, coastal inundation or flooding would have to submit a report by a suitably qualified engineer assessing the risk on a particular site and for any particular development from those hazards over the next 100 years, a challenging proposition for any engineering office, given the inexact nature of climate change science. This in itself will defer development, but probably for reasons of costs as much as the site's intrinsic lack of suitability! Estimates given for engineering reports suggest costs could be between $NZ5000-$NZ20000 per application. [4] To these would be added resource consents costs. As the number of these could be expected to rise significantly, (65% of New Zealanders live within 5 km of the sea) there is a risk from 1) a significant shortage of engineers "suitably qualified" and 2) considerable congestion within the Auckland Council resource consent department. Where the engineer report is favourable, the development would be permitted. If not, then a resource consent application would be required, with subsequent development if allowed, subject to conditions.

In the case of the land included within the photograph in Figure 1, rule (d) would apply to all those sections contained within the hatched area.

PAUP: SUBMISSIONS AND FEEDBACK

The Auckland Council engaged with a range of stakeholder communities and manu whenua (indigenous population) through a variety of online, face to face meetings and media bulletins, with the express aim of soliciting feedback about the PAUP. Some 21,000 submissions were received across an 11week consultation period between 15th March and the end of May 2013. Feedback covered aspects of the natural environment such as air quality, noise, vibration, landfills, earthworks, forestry, storm-water and wastewater, to name but a few. [5]

Submissions: natural hazards and flooding

The submissions for this section, the main focus of this paper, made up a small portion of this total feedback. An estimated 190 submissions were received; a small number when considered against the total number of submissions, but considering the size and scope of the plan and the numerous themes, and the fact that climate and climate change is a new emerging issue for most people, a significant number nonetheless. Within this general theme close to 100 were focused on hazards specifically related to coastal inundation and flooding as a consequence of climate change and predicted SLR. [6]

Most submissions accepted the science around global warming was not precise but were nevertheless concerned that future planning takes the science into account. Some were more strident around at risk land than others, insisting that the PAUP be amended simply to "..avoid new development in natural hazard areas." [7]

The Auckland Regional Public Health Service took a similarly hard line to new developments:

> Add a policy of managed retreat from areas subject to inundation risks and that new developments not be built in these locations. [8]

The Ministry of Conservation took a more 'middle of the road' approach, suggesting only subdivision be permitted only where

> … Subdivision, use and development does not exacerbate the long term risks to people, property and the environment from natural hazards or its their effects, taking into account the effects of climate change. [9]

Others were more accommodating, but wanted greater acknowledgement of the dangers coastal inundation posed and set in place a system that ensured the impact was minimized:

> Amend policy 14 as follows: 'Require the finished floor levels of: a. new dwellings and habitable rooms of non-dwellings b. substantial additions, modifications or extensions to existing dwellings c. located in coastal inundation areas to be above the mapped 1 per cent AEP coastal storm tide event plus 1m projected sea level rise'. [10]

All of the major conservation groups that submitted, including the Ministry of Conservation, the Environmental Defense Society and The Royal Forest and Bird expressed the need to avoid hard engineering solutions wherever possible in mitigating the effects of coastal development in land subject to natural hazards and flooding.

> Amend Objective 2 so that it explicitly refers to discouraging the use of hard engineering solutions. [11]

The Environmental Defense Society also supported this objective:

> Add an additional policy which indicates that any residual adverse effects of hard engineering solutions which cannot be avoided, mitigated or remedied will be offset through restoration and enhancement actions that achieve no net loss and preferably a net gain in terms of impacts on natural heritage values of the coastal environment. [12]

Some submissions recognized the rapid pace of change to the science of climate change and emphasized the need for regular review of policies relating to coastal inundation over time.

> Ensure the maps for coastal inundation and flooding areas apply climate change predictions for the next 100 years. [13]

Further analysis of the submissions suggested submitters concerns were often directly related to the activity of the organization. The New Zealand Fire Service Commission submissions for example, were focused around the implications of bushfire damage to new subdivisions and were after policies that "reduced bushfire risk 'as far as is reasonably practicable', in relation to the design of new residential and commercial subdivision and development in high bushfire risk areas." (867-16) and to : 'Avoid new subdivision and development in high bushfire risk areas where the risk of bushfire cannot be adequately mitigated without significant effects on landscape or biodiversity.' Again, indirectly an acknowledgement of the increased risk from fire due to climate changes. [14]

Submissions from individuals focused on climate change and flooding also reflected the new awareness rapidly emerging in the community that the change in the world environment would have a lasting impact on the more vulnerable of New Zealand's coastal regions.

> Adopt policies that will allow buildings to be easily shifted from the site or lifted over the next 50 years if sea levels rise as predicted [relates to coastal inundation mapping at Tindalls Beach, Manly and Orewa]. [15]

> Adopt policies that will allow a private property owner to contract the council out of any liability or responsibility if sea level rises as predicted [relates to coastal inundation mapping at Tindalls Beach, Manly and Orewa]. This could include registration of a caveat or similar over the title. [16]

Not all submissions were in favour of the natural hazards objectives or policies suggested by the draft plan. Some business groupings, particularly those associated with activities close to water, were apprehensive about the effect the new policies would have on their activities.

> Delete the provisions relating to coastal inundation unless it can be demonstrated by a detailed S32 analysis that application of rules is necessary to manage a resource management issue. [17]

The Ports of Auckland, a key industry within the new Auckland Council, wanted exemption from the policy relating to visual effects on coastal landscape and amenity values

> Amend Policy 8 to replace 'coastal protection works' with 'new coastal protection works', and amend clause (g) as follows 'long-term adverse visual effects on coastal landscape and amenity values, except in the case of the construction and operation of significant infrastructure.' [18]

The PAUP natural hazards initiative: too little too late?

Whilst many submitters (70%) supported the general thrust of the Auckland Council's approach to land subject to Natural Hazards, particularly with respect to coastal inundation, many more were critical of what they regarded as an overly timid approach by the Auckland

Council to its treatment of development proposals. Many wanted more direct intervention in the development process to limit future damage and cost to the vulnerable parts of the coastal environment than the Council was prepared to concede.

The timidity is in part a legacy issue. Many of the smaller councils the super city has absorbed paid only "lip service" to the hazards associated with climate change in their District Schemes and credit must be given to the new draft Auckland Unitary Plan for improving public consciousness in this important but previously neglected area. The legacy issue also influenced the approach to identifying all the natural hazards. Inherited maps identifying natural hazards were often out of date, or otherwise limited

The PAUP Natural Hazards approach is risk adverse, and acknowledged as such by Council. It places the onus (and cost) on the property owner to prove their land is not subject to natural hazards rather than Council defining it does through an extensive and potentially inaccurate Unitary Plan mapping system. The problem with this planning approach is that the full ratification of the Unitary Plan is still some years away and, until its adoption, the Council is unwilling, or legally unable, to implement these restrictions. In the meantime, the old processes in place from the previous Council legacies continue to operate. These are often simply minimal heights for floor levels related to tide datums, or setbacks in the form of coastal protection yards that take no account of hazards that may be associated wi. A case in point may be demonstrated by a Resource Consent application for the foreshore adjacent to Orapiu beach Waiheke, a part of Auckland City with planning provisions currently under the recently ratified Hauraki Gulf District Plan –and with a 30metre setback requirement the only concession to coastal inundation (figure 3). The application, because of the wording of the existing district scheme, takes no account of SLR, yet, as is obvious from figure 2 –taken during a King tide in February 2014 –SLR deserves to be considered!

Developments approved now may become hazardous over time, but because permission has been given, the cost of future proofing the land against set level rise, if required, will likely involve hard engineering works, and the burden fall to the ratepayer.

Other studies, such as the Climate Change Research Institute (CCRI) report, have expressed concern that coastal management at a Local Authority level in New Zealand, particularly in relation to sea-level rise and its effects, is not taken seriously enough, in spite of recent internationally published estimates from researchers such as Rahmstorf 2007 [19] and Pfeffer, et al 2008. [20] A NIWA report written for Auckland Council that includes the afore

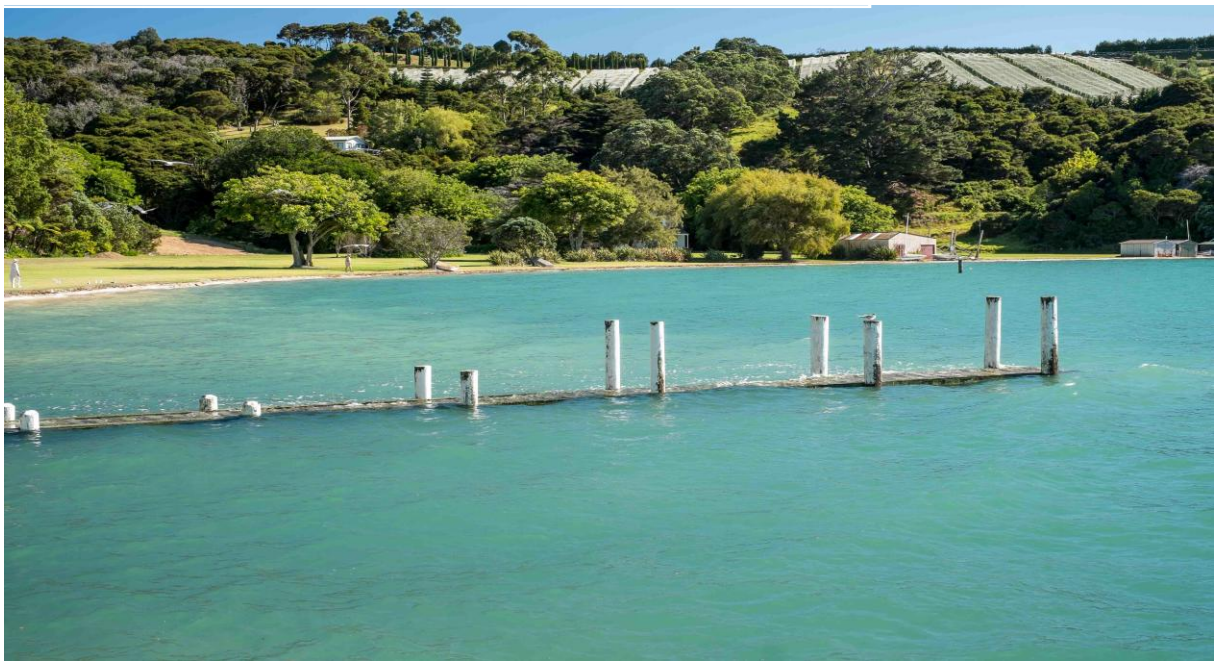

Figure 2. King tide Orapiu beach Waiheke Island (source Richard Wedekind)

Figure 3. Development Orapiu beach Waiheke Island (Source Richard Wedekind)

mentioned authors and others summarizes peer reviewed publications estimating levels of sea level change, most of which indicate significant increase in sea-level rise rates towards the end of the twenty-first century. [21] Indeed some commentators, such as Professor Tim Naish,

a contributor to the International Panel on Climate Change report, suggest existing predictions of sea level may be too conservative.

> We still don't understand SLR enough to get an accurate upper level because of the uncertainty over what may happen with polar ice sheets. The upper level is likely to be underestimated. [22]

CCRI's report expresses the view that existing settlements in the Auckland area may have already accepted the inevitability of a coastal adaptation approach that depends on hard engineering stabilization. This approach, whilst it may be appealing in the short-term, "will decrease community resilience and increase vulnerability in the long term". [23]

Coastal retreat, the planned withdrawal of residential development from areas of acute risk over time, is the approach that to CCRI best reduces community vulnerability. It is also the least appealing option to coastal communities, particularly in coastal land situations where land value is high, as is the case in many parts of coastal Auckland. Resolving this conflict is difficult in an environment that values property above all else. It would require on-going high level leadership, participatory community-led decision-making and climate science information that people trusted. To analyst Frances Sullivan:

> Poor understanding and failure to accept climate change related risk is wide spread in both local and central government…Adapting to climate change is freely talked about in the Pacific Islands with Kiribati looking at buying land in Fiji, as they know they are going to have to move at some point…but few decision makers here are willing or able to come to grips with it. [24]

Mark Bellingham of Forest and Bird (a major NZ conservation organization) has concerns that the Unitary Plan allows new buildings to be built and existing buildings to be improved in these coastal inundation zones.

> The council has a responsibility to Auckland's current and future ratepayers to ensure an orderly retreat from rising sea levels in both urban and rural areas…[its] lack of foresight will make the costs of the leaky homes crisis look like small change. And future ratepayers of Auckland will have to provide to any losses that aren't covered by insurance. [25]

CASE STUDY: KAWAKAWA BAY DEVELOPMENT

The difference in floor level heights between a legacy district plan and the PAUP can be illustrated by comparing the design result for a house development at Kawakawa Bay, a small low lying settlement south of Auckland on the shores of the Hauraki Gulf. The site comes within natural hazards rule (d), it being registered on the PAUP coastal inundation GIS viewer as low lying land subject to coastal inundation. The site in question (contained within Figure 1) is largely flat with ground level on average at a RL of 2.50m. The existing Manukau City Council (MCC) district plan [26] requires house sites in coastal areas for catchment draining into the Waitemata harbour to have a finished floor level no less than 0.5metres above a reduced Lands and Survey level of RL2.90m–effectively making the base floor level of the building RL3.40m (figure 4). The PAUP formula depends on tabled information of the estimated annual exceedance probability (AEP) for tide levels 1 in 100 year storm events (1%), provided by NIWA for the Auckland Council as part of the background analysis. [27] The difference in floor level height is listed in Table 1.

Table 1: Reduced level comparison: legacy district plan and PAUP

Operative Plan	Floor level minimum	Minimum finished floor level RL.
Existing Manukau District Scheme rules sec 9.9.1.2	0.5m above Land & Survey Datum RL 2.90m	3.40m
Proposed PAUP Requirements	0.5m above 1% AEP + 1m SLR =0.5m + RL2.23m[1] + 1.00m	3.73m

Given the existing ground level at the site is RL 2.50 this places the habitable rooms of the building at a new minimum level of 1.23m above the ground, as compared with the existing minimum of 0.90, a difference in height of 230mm.

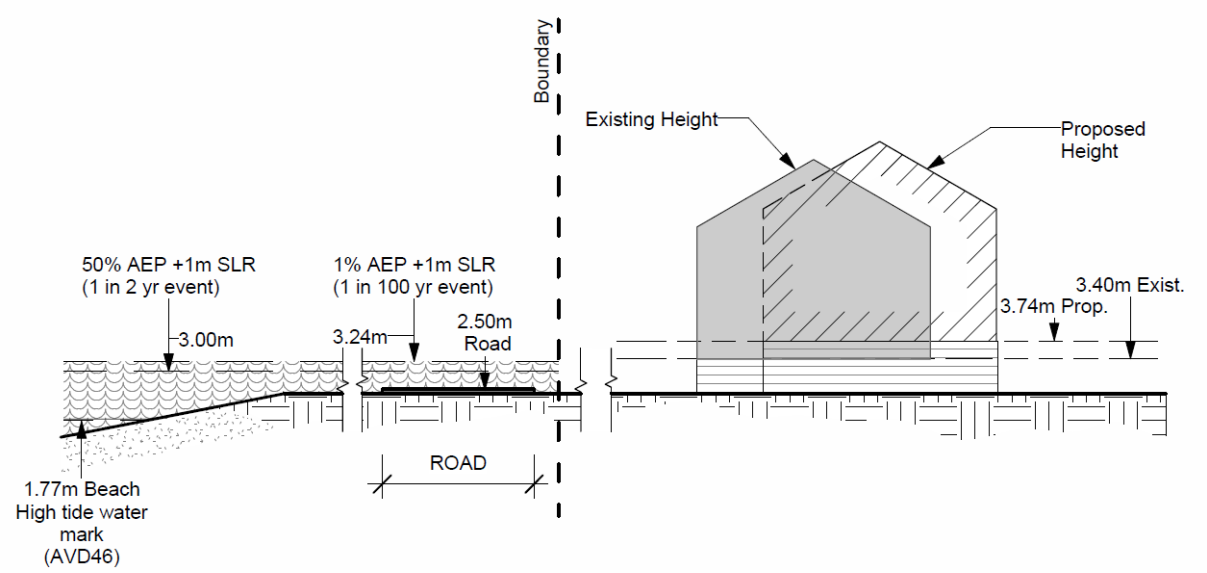

Figure 4. Sea level height comparison: existing MCC district scheme and PAUP

At the site in question in Kawakawa Bay however (figure 4), no buffer exists between sea and section. The road levels remain about RL 2.50m before a small coastal strip falls away to the beach, meaning that, even AEP 50% events (i.e. 1 in 2 year storms) with a 1metre SLR would likely see water levels at RL 3.00m, half a metre above the road and the section in question! Hard engineering works in the form of an earth buffer encircling the entire bay and inflowing streams would be necessary to stave off constant flooding of the local residential area, an option for reasons of cost not feasible. In addition, hazards relating to SLR and coincidence with major storm events may exacerbate the effects of flooding from land runoff here and elsewhere, particularly as in Kawakawa Bay where developments are close to the coast and the mouths of streams or major overland flow paths. These may influence extent and depth of flooding, hazardous flow velocities and increased erosion.

The engineering report required under the PAUP rules for any particular application along this coastal strip is hence likely to be negative, resulting in the need for a special "resource consent" application to the Auckland Council for each and any applicant wishing to alter their house or build anew, with all the inherent time and cost involved. It is hard to speculate given the objectives underpinning the role of the PAUP with regard to natural hazards (reference [2]

[1] Value extrapolated from Reference [27] Fig 4-1 and Table 4-1.

above), how in this situation any such application could have a positive outcome for the applicant.

CONCLUSION

The inclusion of digital mapping overlays indicating the extent of coastal inundation and SLR into the PAUP is a significant step forward for such unitary plans, in so far that for the first time across the 3100 km of coastline within the new Auckland city precincts there exists firm, easily accessible data for planners, architects, engineers and the public on the consequences of climate change and SLR for low lying coastal land.

Feedback on the natural hazards section of the PAUP and research from other reports such as CCRI and NIWA research, gives weigh to the view that the PAUP, whilst an advance on legacy council thinking, is too reactive and individualized in its approach to natural hazards. At Kawakawa Bay, as in other low-lying communities, a sustainable solution to SLR needs to be worked through, ideally in tandem with the community. The case study projection suggests the challenges faced are beyond the capacity of the individual site owner to deal with, -tidal surges have no respect for site boundaries-yet proactive planning strategies for vulnerable coastal urban settlements appear to be missing from the PAUP, with the emphasis solely on individual site resource consent applications and decisions as the way forward. In the short term hence, it would appear the new policy approach to mitigating coastal hazards outlined in the PAUP will have little effect on the make up of urban settlements such as Kawakawa Bay, with ongoing development permitted in a piecemeal fashion subject only to floor level height restrictions. In the long term however, if we accept the inevitability of SLR, then communities such as this will face increased uncertainty over insurability and hence the value of coastal property. Sustainable solutions to these issues present considerable challenges to local and national government in their quest to meet the social, economic, cultural and health and safety criteria set for people and communities by the over arching Resource Management Act.

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